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**Guidance for Setting Reasonable Progress
Goals Under the Regional Haze Program**

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Air Quality Policy Division
Geographic Strategies Group
Research Triangle Park, NC

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Abbreviations and Acronyms

BACT - Best Available Control Technology

BART - Best Available Retrofit Technology

CAA - Clean Air Act

CAIR - Clean Air Interstate Rule

CFR - Code of Federal Regulations

dv - Deciviews

EPA - Environmental Protection Agency

FLM - Federal Land Manager

FR - Federal Register

NO_x - A mixture of nitrogen dioxide (NO₂), nitric oxide (NO), and other nitrogen oxide gases

NAAQS - National Ambient Air Quality Standard

OAQPS - Office of Air Quality Planning and Standards

PM_{2.5} - Particulate Matter of 2.5 microns or less in size

RHR - Regional Haze Rule

RPG - Reasonable Progress Goal

RPO - Regional Planning Organization

SIP - State Implementation Plan

yr - Year

1.0 INTRODUCTION

The purpose of this document is to provide guidance to States in setting reasonable progress goals (RPGs) as part of their regional haze state implementation plans (SIPs) and in deciding those measures necessary to meet these goals. We emphasize that this document is merely guidance and that States or the Environmental Protection Agency (EPA) may elect to follow or deviate from this guidance, as appropriate. The ultimate determination of whether a given SIP submission by a State meets the statutory requirements of sections 169A and 169B of the Clean Air Act (CAA) and the regional haze regulations at 40 CFR 51.300 - 309 will be accomplished through notice and comment rulemaking in which the facts and circumstances of each State submission will be evaluated by EPA.

Under the Tribal Authority Rule, 40 CFR part 49, Tribes have the authority to seek “treatment as a State” for purposes of administering certain CAA programs, including the regional haze program. Whether Tribes seek this authority or not, EPA encourages Tribes to participate in the regional planning efforts to address visibility and to consult with neighboring States as they develop their regional haze SIPs. We hope that this guidance will provide Tribes with an understanding of the process for establishing RPGs that will assist them in the consultation process.

1.1 Legislative and Regulatory History

The CAA was amended in August 1977, and a new section 169A was added for the protection of visibility in mandatory class I Federal areas (Class I areas) of great scenic importance. In section 169A(a)(1), Congress established the national goal for visibility protection:

Congress hereby declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which impairment results from manmade air pollution.

Section 169A(a)(4), in part, requires EPA to “promulgate regulations to assure reasonable progress toward meeting the national goal.” The CAA also requires States to submit SIPs containing such emission limits, schedules of compliance, and other measures as may be necessary to make reasonable progress toward meeting the goal.¹

¹ CAA §169A(b)(2).

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In the CAA Amendments of 1990, Congress added section 169B to strengthen and reaffirm the national goal. Section 169B(e) calls for EPA to “carry out the Administrator’s regulatory responsibilities under [section 169A], including criteria for measuring ‘reasonable progress’ toward the national goal.”

In response to these mandates, EPA promulgated the regional haze rule (RHR) on July 1, 1999.² Under section 51.308(d)(1) of this rule, States must “establish goals (expressed in deciviews) that provide for reasonable progress towards achieving natural visibility conditions” for each Class I area within a State. These RPGs must provide for an improvement in visibility for the most impaired days over the period of the implementation plan and ensure no degradation in visibility for the least impaired days over the same period.³

The RHR also requires States to submit a long-term strategy that includes such measures as are necessary to achieve the RPG for each Class I area.⁴ The regulations require States to consider major and minor stationary sources, mobile sources, and area sources in developing their long-term strategies. In addition, States must submit a SIP that contains either emission limitations representing best available retrofit technology (BART) for certain sources put into operation between 1962 and 1977 *or* alternative measures that provide for greater reasonable progress than BART.⁵ The BART requirements were addressed in a rule revising certain provisions of the regulations in section 51.308(e) and promulgating the BART Guidelines.⁶

1.2 Meaning of the Term “Reasonable Progress Goal”

States must establish RPGs, measured in deciviews (dv), for each Class I area for the purpose of improving visibility on the haziest days and ensuring no degradation in visibility on the clearest days over the period of each implementation plan.⁷ RPGs are interim goals that represent incremental visibility improvement over time toward the goal of natural background conditions and are developed in consultation with other affected States and Federal Land

² 64 FR 35714 (codified at 40 CFR 51.300-309).

³ 40 CFR 51.308(d)(1).

⁴ 40 CFR 51.308(d)(3).

⁵ 40 CFR 51.308(e).

⁶ 70 FR 39104 (July 6, 2005).

⁷ 40 CFR 51.308(d)(1).

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Managers (FLM).⁸

In determining what would constitute reasonable progress, section 169A(g) of the CAA requires States to consider the following four factors:

- The costs of compliance;
- The time necessary for compliance;
- The energy and non-air quality environmental impacts of compliance; and
- The remaining useful life of existing sources that contribute to visibility impairment.⁹

States must demonstrate in their SIPs how these factors are taken into consideration in selecting the RPG for each Class I area in the State.

The discussion of the statutory factors in this guidance is largely aimed at helping States apply these factors in considering measures for point sources. States may find that the factors can be applied to sources other than point sources; the meaning of the factors, however, should not be unduly strained in order to fit non-point sources. In other words, if common sense dictates that a particular statutory factor cannot be applied to a particular source category, then the State's analysis may reflect that fact, and emissions reductions from such sources may still be included in the SIP.

As noted above, the RHR establishes an additional analytical requirement for States in the process of establishing the RPG. This analytical requirement requires States to determine the rate of improvement in visibility needed to reach natural conditions by 2064, and to set each RPG taking this "glidepath" into account.¹⁰ (The process for determining the glidepath is discussed later in this document.) EPA adopted this approach, in part, to ensure that States use a common analytical framework that accounts for the regional differences affecting visibility and, in part, to ensure an informed and equitable decision making process. The glidepath is not a presumptive target, and States may establish a RPG that provides for greater, lesser, or equivalent visibility improvement as that described by the glidepath.

⁸ 40 CFR 51.308(d)(1)(iv) and 51.308(i).

⁹ CAA §169A(g)(1); 40 CFR 51.308(d)(1)(i)(A).

¹⁰ 40 CFR 51.308(d)(1)(i)(B).

In deciding what amount of emissions reduction is appropriate in setting the RPG, you should take into account the fact that the long-term goal of no manmade impairment encompasses several planning periods. It is reasonable for you to defer reductions to later planning periods in order to maintain a consistent glidepath toward the long-term goal.

1.3 Relationship of Reasonable Progress to BART and the Long-Term Strategy

The RPGs, the long-term strategy, and BART (or alternative measures in lieu of BART) are the three main elements of the regional haze SIPs that States are required to submit by December 17, 2007. The long-term strategy and BART emissions limitations or other alternative measures, including cap-and-trade programs or other economic incentive approaches, are inherently related to the RPG. The long-term strategy is the compilation of “enforceable emissions limitations, compliance schedules, and other measures as necessary to achieve the [RPGs],”¹¹ and is the means through which the State ensures that its RPG will be met. BART emissions limits (or alternative measures in lieu of BART, such as the Clean Air Interstate Rule (CAIR)) are one set of measures that must be included in the SIP to ensure that an area makes reasonable progress toward the national goal, and the visibility improvement resulting from BART (or a BART alternative) is included in the development of the RPG.

¹¹ 40 CFR 51.308(d)(3),

2.0 OVERVIEW OF THE PROCESS FOR DEVELOPING THE RPG

Development of the RPG for each Class I area should be a collaborative process among State, local, and Tribal authorities, Regional Planning Organizations (RPOs), and FLMs. Steps for developing RPGs will be briefly outlined in this section of the guidance, along with references to other guidance and rules where additional detail can be found. The remaining sections of this guidance expand on particular aspects of these steps. In addition, as this is guidance for States in developing RPGs, the use of “you” through the rest of the document refers to States.

2.1 Establish Baseline and Natural Visibility Conditions

To track progress toward the national goal, the RHR, among other things, requires you to establish the “baseline conditions” representing visibility for the best and worst days at the time the regional haze program is established for each Class I area. Once established, the baseline represents the starting point from which reasonable progress will be measured. The RHR also requires you to estimate “natural conditions” for each Class I area that represents the visibility conditions that would exist in the absence of man-made impairment.

As explained in the RHR, the baseline for each Class I area is the average visibility (in dv) for the 20 percent most impaired days, or “worst days”, and for the 20 percent least impaired days, or “best days,” for the years 2000 through 2004.¹² Using available monitoring data for the 2000 to 2004 time period, you are required to calculate the baseline by averaging the annual values (in dv) for the 20 percent worst days in each year (yr) to produce a single value (in dv) that represents the baseline conditions for the worst days. You should follow the same approach for determining the value that represents the baseline conditions for the best days. Natural conditions at each Class I area are also expressed by reference to the level of visibility (in dv) for the 20 percent most impaired and least impaired days.¹³

¹² 64 FR at 35730.

¹³ For more detail on determining baseline and natural conditions, you can review the preamble and regulations in the RHR, 64 FR at 35728 – 35730, 40 CFR 51.308(d)(2), EPA’s *Guidance for Tracking Progress Under the Regional Haze Rule*, EPA-454/B-03-004 (September 2003) available at www.epa.gov/ttn/oarpg/t1/memoranda/rh_tpurhr_gd.pdf, and EPA’s *Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule*, EPA-454/B-03-005 (September 2003) available at www.epa.gov/ttn/oarpg/t1/memoranda/rh_envcurhr_gd.pdf.

2.2 Determine the Glidepath, or Uniform Rate of Progress

By comparing baseline conditions with natural conditions, you can determine the uniform rate of visibility improvement, or progress, needed to reach natural conditions by 2064 for each Class I area. Figure 1, below, illustrates the basic steps in the process for calculating the uniform rate of progress toward natural conditions for the first planning period at a hypothetical Class I area.

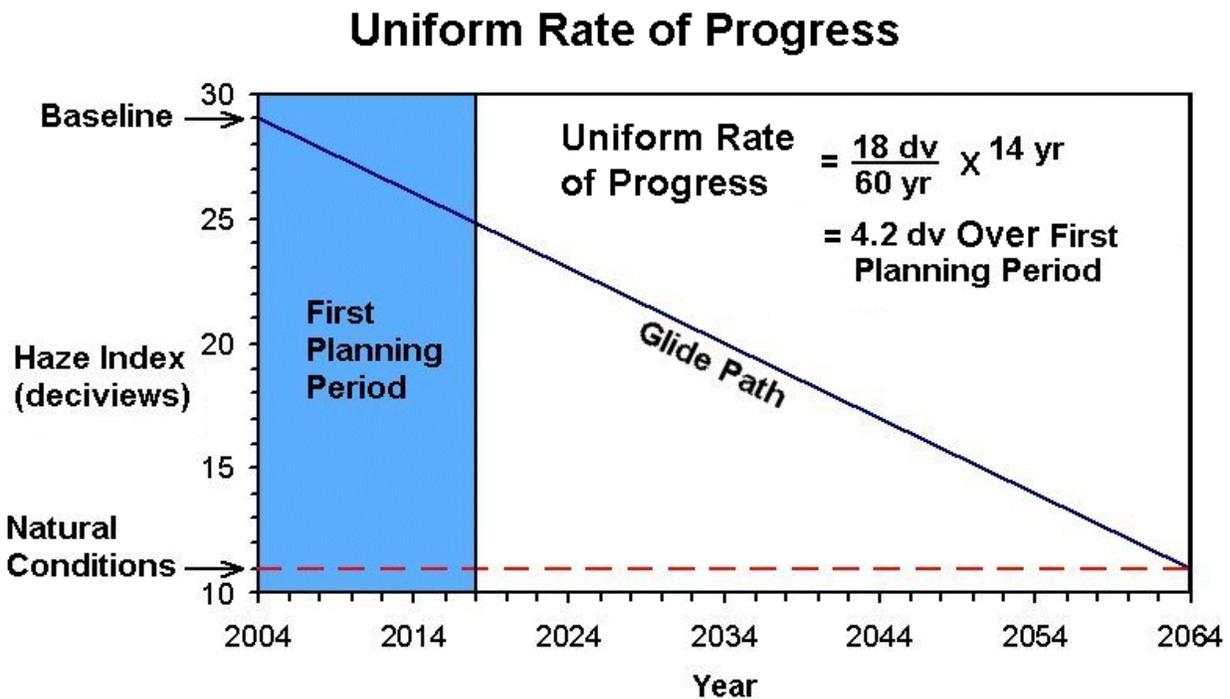


Figure 1

Figure 1 Example of a Uniform Rate of Progress

- Compare baseline conditions to natural conditions. The difference between these two represents the amount of progress needed to reach natural visibility conditions. In this example, the State has determined that the baseline for the 20 percent worst days for the Class I area is 29 dv and estimated that natural background is 11 dv, a difference of 18 dv.
- Calculate the annual average visibility improvement needed to reach natural conditions by 2064 by dividing the total amount of improvement needed by 60 years (the period between 2004 and 2064). In this example, this value is 0.3 dv/yr.

- Multiply the annual average visibility improvement needed by the number of years in the first planning period (the period from 2004 until 2018). In this example, this value is 4.2 dv. This is the uniform rate of progress that would be needed during the first planning period to attain natural visibility conditions by 2064.

If you were to achieve this steady improvement in visibility over the next 60 years, you would reach the national goal by 2064.

2.3 Identify and Analyze the Measures Aimed at Achieving the Uniform Rate of Progress.

The next step in setting an RPG is to identify and analyze the measures aimed at achieving the uniform rate of progress and to determine whether these measures are reasonable based on the statutory factors identified in Section 1.2 above. To meet this requirement, we suggest the following approach which ensures that States consider all reasonable measures in developing their regional haze SIPs:

- Identify the key pollutants and sources and/or source categories that are contributing to visibility impairment at each Class I area. The sources of impairment for the most impaired and least impaired days may differ. Section 3 discusses this process.
- Identify the control measures and associated emission reductions that are expected to result from compliance with existing rules *and* other available measures for the sources and source categories that contribute significantly to visibility impairment. This is covered in more detail in Section 4.
- Determine what additional control measures would be reasonable based on the statutory factors and other relevant factors for the sources and/or source categories you have identified.
- Estimate through the use of air quality models the improvement in visibility that would result from implementation of the control measures you have found to be reasonable and compare this to the uniform rate of progress.

Another possible approach that some States and RPOs are using is to “back out” the measures necessary to achieve the uniform rate of progress. In this process, States are using dispersion modeling to estimate the visibility impacts of a specific percentage reduction in visibility impairing pollutants. The resulting visibility conditions are then compared to the uniform rate of progress. Using this process, States will be able to identify a percentage

reduction in visibility impairing pollutants that would provide progress at or beyond the uniform rate of progress. In a separate step, States would consider the statutory factors along with other relevant factors to select appropriate measures to achieve the identified reduction in emissions. States can thus identify the measures that would be needed to achieve the uniform rate of progress at a Class I area and determine whether such measures are reasonable.

2.4 Establish a RPG

In developing a RPG, you must consult with other States with emissions sources that may reasonably be anticipated to cause or contribute to visibility impairment at Class I areas in your State.¹⁴ The regulations anticipate that States may not always agree on what measures would be reasonable or on the appropriateness of a RPG. We encourage States to work together early and often to resolve such issues. In addition, the FLMs may provide insight and assistance to States in identifying regional approaches to address the RPG.

The improvement in visibility resulting from implementation of the measures you have found to be reasonable, considering the uniform rate of progress, is the amount of progress that represents your RPG. The regional haze rule requires you to clearly support your RPG determination in your SIP submission based on the statutory factors.¹⁵

¹⁴ 40 CFR 51.308(d)(1)(iv).

¹⁵ 40 CFR 51.308(d)(1)(i)(A).

3.0 IDENTIFYING KEY POLLUTANTS AND SOURCE CATEGORIES FOR THE FIRST PLANNING PERIOD

This process begins with the identification of key pollutants and source categories that contribute to visibility impairment at the Class I area. Such analysis has been the subject of considerable study over the past decade, including studies by the Grand Canyon Visibility Transport Commission and ongoing work by RPOs. For the purpose of this document, it is assumed that analyses identifying the key pollutants contributing to visibility impairment have been conducted for each Class I area.

3.1 Identification of Source Categories From Which These Pollutants and Their Precursors Are Emitted

Once the key pollutants contributing to visibility impairment at each Class I area have been identified, the sources or source categories responsible for emitting these pollutants or pollutant precursors can also be determined. There are several tools and techniques being employed by the RPOs to do so, including analysis of emission inventories, source apportionment, trajectory analysis, and atmospheric modeling. Technical guidance on these tools and techniques is beyond the scope of this document. Instead, this document focuses on policy considerations relevant to the identification of which source categories should be considered as part of the regional haze SIP development process.

When identifying the sources or source categories responsible for regional haze, you should consider the relationship between the RPG and the requirements for long-term strategies. The regulations require States to consider major and minor stationary sources, as well as mobile and area sources, in developing long-term strategies.¹⁶ At a minimum, the regulations require you to consider several factors when developing a long-term strategy, including the following:

- Emissions reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment and those taken to attain the fine particulate matter (PM_{2.5}) national ambient air quality standards (NAAQS).
- Measures to mitigate the impact of construction activities.
- Smoke management techniques for agricultural and forestry management purposes.

¹⁶ 40 CFR 51.308(d)(3)(iv).

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- Anticipated visibility effects from changes in point, area, and mobile source emissions.¹⁷

As illustrated by these factors, States should consider a broad array of sources and activities when deciding which sources or source categories contribute significantly to visibility impairment.

¹⁷ 40 CFR 51.308(d)(3)(v).

4.0 IDENTIFY CONTROL MEASURES FOR CONTRIBUTING SOURCE CATEGORIES FOR THE FIRST PLANNING PERIOD

There are numerous possible conceptual approaches that you can use to identify control measures for the long-term strategy and the related RPG. We suggest beginning by concentrating on possible emissions reductions of several pollutant species from a few selected source sectors, focusing on those source categories that may have the greatest impact on visibility at Class I areas, considering cost and the other factors discussed further in Section 5.0.

4.1 Consideration of Emissions Reductions from State, Federal, and Local Control Measures

One important factor to keep in mind when establishing a RPG is that you cannot adopt a RPG that represents less visibility improvement than is expected to result from the implementation of other CAA requirements.¹⁸ You must therefore determine the amount of emission reductions that can be expected from identified sources or source categories as a result of requirements at the local, State, and federal levels during the planning period of the SIP and the resulting improvements in visibility at Class I areas. Given the significant emissions reductions that we anticipate to result from BART, the CAIR, and the implementation of other CAA programs, including the ozone and PM_{2.5} NAAQS, for many States this will be an important step in determining your RPG, and it may be all that is necessary to achieve reasonable progress in the first planning period for some States.

The first step in this process is to identify the baseline emissions inventory year on which your strategies are based. For the first RHR SIP, we anticipate that States will use 2002 as the baseline year for emission inventories.¹⁹ If you do use 2002, you may take credit in your long-term strategy for emission reductions achieved after 2002. This includes emission reductions from measures implemented to attain the ozone and PM_{2.5} NAAQS,²⁰ and Federal programs, such as the national mobile source program and federal standards for hazardous air pollutants (air toxics).

¹⁸ 40 CFR 51.308(d)(1)(vi).

¹⁹ 40 CFR 51.308(d)(3)(iii) provides that the baseline emission inventory year is presumed to be the most recent year of the consolidated emissions inventory for the SIP. A memorandum from OAQPS, entitled *2002 Base Year Emission Inventory SIP Planning: 8-hr Ozone, PM 2.5, and Regional Haze Programs* (November 18, 2002) (“2002 EI Memo”), identifies 2002 as the anticipated baseline emission inventory year for regional haze. See www.epa.gov/ttn/oarpg/t1/memoranda/2002bye_gm.pdf

²⁰ 2002 EI Memo at 3-4.

4.2 Identification of Additional Emissions Control Strategies for the Source Categories Identified

After determining the amount of emissions reductions of visibility impairing pollutants that may be expected from implementation of other CAA programs, you will be ready to identify any additional measures that are reasonable. The RHR gives States wide latitude to determine additional control requirements, and there are many ways to approach identifying additional reasonable measures; however, you must at a minimum, consider the four statutory factors. Based on the contribution from certain source categories and the magnitude of their emissions you may determine that little additional analysis is required to determine further controls are not warranted for that category. As discussed further in section 5, you have considerable flexibility in how you take these factors into consideration. In addition to source-specific controls, emissions cap-and-trade programs may be considered. Sources of information on control techniques for specific source categories include the RACT/BACT/LAER Clearinghouse and EPA's AIRControlNet database.²¹

One approach that you could take to streamline what could be an extremely complex task would be to first identify alternative control scenarios with different levels of stringency. Each control scenario would assume application of specific control levels or measures to the sources or source categories you have identified as the significant sources of visibility impairment. As indicated previously in section 4.1, the starting point for this assessment is the visibility improvement achieved as a result of BART, the CAIR, and the implementation of other CAA programs, including other measures for attainment of the ozone and PM_{2.5} NAAQS. You would then consider whether any additional control scenarios are reasonable based on your consideration of the statutory factors and any other factors you have determined are relevant.

Another approach you could take, consistent with the "back out" approach discussed in section 2.3, would involve identifying the set of emissions control measures that achieves the target percentage reductions in visibility-impairing pollutants associated with progress at or beyond the uniform rate of progress. The selection of control measures to include in this set would be guided by your consideration of the statutory factors and any other factors you have determined are relevant.

Note that for some sources determined to be subject to BART, the State will already have completed a BART analysis. Since the BART analysis is based, in part, on an assessment of many of the same factors that must be addressed in establishing the RPG, it is reasonable to

²¹ Information on AirControlNET can be found at www.epa.gov/ttn/ecas/econtool.html. The RACT/BACT/LAER Clearinghouse is located at <http://cfpub.epa.gov/rblc/htm/bl02.cfm>.

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conclude that any control requirements imposed in the BART determination also satisfy the RPG-related requirements for source review in the first RPG planning period. Hence, you may conclude that no additional emissions controls are necessary for these sources in the first planning period.

5.0 APPLYING STATUTORY FACTORS TO POTENTIALLY AFFECTED STATIONARY SOURCES

In determining reasonable progress, CAA §169A(g)(1) requires States to take into consideration a number of factors. However, you have flexibility in how to take into consideration these statutory factors and any other factors that you have determined to be relevant. For example, the factors could be used to select which sources or activities should or should not be regulated, or they could be used to determine the level or stringency of control, if any, for selected sources or activities, or some combination of both. The factors may be considered both individually and/or in combination. As noted in section 4.1, given the significant emissions reductions that we anticipate to result from BART, the CAIR, and the implementation of other CAA programs, these reductions may be all that is necessary to achieve reasonable progress in the first planning period for some States. Also, as noted in section 4.2, it is not necessary for you to reassess the reasonable progress factors for sources subject to BART for which you have already completed a BART analysis.

5.1 Reasonable Progress Statutory Factor (a): Costs of Compliance

The first factor to take into consideration is the “costs of compliance.” In this context we believe that the cost of compliance factor can be interpreted to encompass the cost of compliance for individual sources or source categories, and more broadly the implication of compliance costs to the health and vitality of industries within a state. For additional guidance on applying the cost of compliance factor to stationary sources, you may wish to consult the BART guidelines, referenced above.

To assess compliance costs for individual sources or source categories potentially subject to emission limitations, we suggest that you use established control cost analysis techniques. For stationary sources, generally this involves the following:²²

- a) Identify the emissions units to be controlled;
- b) Identify the design parameters for emissions controls; and
- c) Develop cost estimates based upon those design parameters.

²² As noted above, application of the cost factor to non-point sources is beyond the scope of this guidance. This is also true for mobile sources.

You should evaluate both average and incremental costs. To maintain and improve consistency wherever possible, cost estimates should be based on EPA's *Air Pollution Control Cost Manual*.²³

In considering the cost of compliance factor, you should keep in mind that different pollutants differently impact visibility impairment. For example, on a ton basis, sulfur dioxide-related particles have a greater impact on visibility impairment than crustal material. Therefore, in assessing additional emissions reduction strategies for source categories or individual, large scale sources, simple cost effectiveness estimates based on a dollar-per-ton calculation may not be as meaningful as a dollar-per-deciview calculation, especially if the strategies reduce different groups of pollutants.

5.2 Reasonable Progress Statutory Factor (b): Time Necessary for Compliance

The second factor is the “time necessary for compliance.” It may be appropriate for you to use this factor to adjust the RPG to reflect the degree of improvement in visibility achievable within the period of the first SIP if the time needed for full implementation of a control measure (or measures) will extend beyond 2018. For example, if you anticipate that constraints on the availability of construction labor will preclude the installation of controls at all sources of a particular category by 2018, the visibility improvement anticipated from installation of controls at the percentage of sources that *could* be controlled within the strategy period should be considered in setting the RPG and in establishing the SIP requirements to meet the RPG.

5.3 Reasonable Progress Statutory Factor (c): Energy and Non-Air Impacts

The third factor is “energy and non-air environmental impacts.” In assessing energy impacts, you may want to consider whether the energy requirements associated with a control technology result in energy penalties. For example, controls on diesel engines may decrease the engine's fuel efficiency, leading to an increase in diesel fuel consumption. Or, a particular control may require a fuel unavailable in the area. To the extent that these considerations are quantifiable they should be included in the engineering analyses supporting compliance cost estimates.

Some examples of non-air environmental impacts that you may wish to consider, are the effects of the waste stream that may be generated by a particular control technology, and/or other

²³ Any additional information used for the cost calculations, including any information supplied by vendors that affects your assumptions regarding purchased equipment costs, equipment life, replacement of major components, and any other element of the calculation that differs from the *Control Cost Manual*, should be documented. EPA's *Control Cost Manual* is located at: www.epa.gov/ttn/catc1/products.html#cccinfo.

resource consumption rates such as water, water supply, and waste water disposal. To the extent that these considerations are quantifiable, they should also be included in the analyses supporting compliance cost estimates.

For additional guidance on applying this factor to stationary sources, you may wish to consult the BART Guidelines, referenced above.

5.4 Reasonable Progress Statutory Factor (d): The Remaining Useful Life of the Source

The fourth statutory factor is “the remaining useful life of any existing source subject to [reasonable progress] requirements.” This factor is generally best treated as one element of the overall cost analysis. The “remaining useful life” of a source, if it represents a relatively short time period, may affect the annualized costs of retrofit controls. For example, the methods for calculating annualized costs in EPA’s *Air Pollution Control Cost Manual* require the use of a specified time period for amortization that varies based upon the type of control. If the remaining useful life of the source will clearly exceed this time period, the remaining useful life factor has essentially no effect on control costs and on the reasonable progress determination process. Where the remaining useful life of the source is less than the time period for amortizing the costs of the retrofit control, you may wish to use this shorter time period in your cost calculations.

For additional guidance on applying this factor to stationary sources, you may wish to consult the BART Guidelines, referenced above.